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The Sandstone Tests

Roger Meade, C-NR

Operation Sandstone, the second postwar test series, had the primary objective of testing new designs of atomic weapons. X-Ray, the first test, exploded with a yield of 37 kilotons - nearly twice that of Fat Man – on April 14, 1948. Yoke, whose yield was 49 kilotons, was fired on April 30th. Zebra, the third and final test, was conducted on May 14th. Although Zebra's yield of 18 kilotons was only equivalent to Trinity, the test was successful because of how it used its nuclear material. Scientific Director Froman summed up Sandstone by saying, "Los Alamos will undoubtedly be able to further improve the design of atomic weapons."

In 1947, the Atomic Energy Commission (AEC) inherited an obsolete and nearly non-existent nuclear stockpile. Accordingly, its first mission, said Oppenheimer, "was to provide atomic weapons and good atomic weapons, and many atomic weapons." This mission was accomplished because the Sandstone devices were "appreciably more efficient," utilizing the available fissionable material "much more nearly in proportion to their supply and production rates."

Norris Bradbury, in consultation with the AEC, identified five design improvements that required testing. However, there were two serious constraints: limited stocks of fissile material and the existence of only three shot towers. Laboratory Associate Director John Manley, developed a scheme whereby design features were combined, reducing the number of tests to three. Manley's strategy worked. Each weapon behaved essentially as predicted providing a "significant amount" of information about the underlying processes of nuclear explosions. This meant, said Froman that both the short and long range military positions of the country were assured by providing models that could be immediately stockpiled as well as designs that could be developed into even better weapons.

Sandstone also confirmed the value of radiochemistry and high-speed photography, experimental techniques that would be used with increasing sophistication in all future weapon tests. During Sandstone, radioactive airborne debris was collected by filter units mounted on drone aircraft flown through each of the three radioactive clouds. Exposed filters were then quickly flown to Los Alamos for analysis. Radiochemistry, said Froman, supplied "our best information on the absolute values of the efficiencies and yields of the various weapons tested" as well as "pertinent information on the relative worth of different sources of nuclear energy (such a plutonium and enriched uranium)." High speed "Fastax" photographs, taken at 10,000 frames per second, not only provided data on the relative yield of each explosion, it was a means used to further perfect implosion. In sum, Sandstone advanced weapon design and provided the scientific foundation for the development of boosting and thermonuclear weapons.